ENABLING PRINTING FEATURES FOR AUTHORIZED USERS

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention generally relates to printing. In particular, the invention relates to systems and methods for selectively enabling one or more features of a printing device so that the feature(s) can be used by authorized users.

DESCRIPTION OF THE RELATED ART

Printing devices, such as printers, typically are provided with numerous features. For instance, printers can be configured to provide various fonts and half-toning. These features typically are implemented in firmware that is installed in the printing devices.

Over time, new features tend to become available for use by printing devices. When this occurs, a user typically must purchase a new printing device that exhibits the desired feature(s). Although a particular user may desire use of a particular feature, that user may, however, be unwilling to purchase a new printing device to have access to that feature.

Based on the foregoing, it should be appreciated that there is a need for improved systems and methods which address these and/or other shortcomings of the prior art.

SUMMARY OF THE INVENTION

The present invention relates to enabling one or more features of a printing device so that the feature(s) can be used by authorized users. In this regard, a representative embodiment of a print system of the invention includes a printing device and a feature-enabling system. The printing device includes a first print cartridge that contains a print substance for printing on a print medium and a readable identification tag for providing first information. The printing device also includes an identification reader that is configured to receive the first information from the identification tag. So configured, if the first information corresponds to the printing device, the identification reader enables the printing device to print.

The feature-enabling system communicates with the printing device and is configured to receive information corresponding to an authorization of a user. The information preferably includes a designation of at least a first feature of the printing device that the user desires to enable. The feature-enabling system also is adapted to retrieve information, *i.e.*, information adapted to enable at least the first feature of the printing device, and enable at least the first feature of the printing device using the information retrieved.

A representative embodiment of a method of the invention for enabling features of a printing device includes: receiving information corresponding to an authorization of a user, the information including a designation of at least a first feature of the printing device the user desires to enable; retrieving information adapted to enable at least the first feature of the printing device; and enabling at least the first feature of the printing device using the information retrieved.

A representative embodiment of a computer readable medium of the invention for use with a printing device includes logic configured to receive information

corresponding to an authorization of a user at a printing device. Preferably, the information includes a designation of at least a first feature the user desires to enable. The computer readable medium also includes logic configured to retrieve information adapted to enable at least the first feature of the printing device, and logic configured to enable at least the first feature of the printing device using the information retrieved.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention, as defined in the claims, can be better understood with reference to the following drawings. The drawings are not necessarily to scale, emphasis instead being placed on clearly illustrating the principles of the present invention.

FIG. 1 is a schematic diagram depicting an embodiment of a print system of the present invention.

FIG. 2 is a flowchart depicting functionality of the embodiment of the print system of FIG. 1.

FIG. 3 is a schematic diagram of a printing device that can be used in a print system of the present invention, showing detail of an identification reader system interacting with identification information and feature authorization information.

FIG. 4 is a schematic diagram depicting an embodiment of a radio frequency identification system that can be used in print systems of the present invention.

FIG. 5 is a schematic diagram depicting a computer or processor-based device that can be used to implement a feature-enabling system of the present invention.

FIG. 6 is a flowchart depicting functionality of an embodiment of the feature-enabling system of FIG. 5.

FIG. 7 is a flowchart depicting functionality of another embodiment of the feature-enabling system of FIG. 5.

FIG. 8 is a schematic diagram depicting another embodiment of a print system of the present invention.

FIG 9 is a flowchart depicting functionality of an embodiment of the feature-enabling system of FIG. 8.

FIG. 10 is a flowchart depicting functionality of another embodiment of the feature-enabling system of FIG. 8.

DETAILED DESCRIPTION

As will be described in greater detail herein, systems and methods of the present invention potentially enable users to enable various features of printing devices. In particular, systems and methods of the invention can potentially enable one or more users to activate one or more features of a printing device selectively. Preferably, selective enabling of a feature is facilitated by the use of feature-enabling information. In some embodiments, the feature-enabling information is identified by use of a tag, which can be assigned to a user. As will be described in detail herein, once the feature-enabling information has been identified, the printing device can access the information and enable the feature associated therewith.

Reference will now be made to the drawings, wherein like reference numerals indicate corresponding components throughout the several views. As shown in FIG. 1, an embodiment of a print system 10 of the present invention can be implemented by a computer network. In FIG. 1, print system 10 includes a feature-enabling system 100 that is associated with a printing device 110. As used herein, "printing device" refers to any device(s) that is able to receive information and convert the information

to hard copy. By way of example, printers, facsimile machines and multi-function devices are printing devices. The computer network of FIG. 1 also includes a communication link 120 that enables various devices to communicate with the printing device. In particular, workstation 130, server 140 and feature-enabling information 150 (described later) can communicate via the communication link.

Communication link 120 can include one or more of a direct link(s), *e.g.*, a communication cable, and a network(s). Such a network can employ any network topology, transmission medium, or network protocol. For example, the network may be any public or private packet-switched or other data network, including circuit-switched networks, such as the public switched telephone network (PSTN), wireless network, or any other desired communications infrastructure and/or combination of infrastructures.

Also depicted in FIG. 1 is feature authorization information 160. As will be described in greater detail herein, feature authorization information 160 typically is associated with a user and is adapted to enable the user to initiate the enabling of one or more features of printing device 110. In particular, the feature authorization information can interact with feature-enabling system 100 so that the feature-enabling system enables the printing device to exhibit one or more features desired by the user. By way of example, such features could include fonts, digital signatures, half-toning algorithms, *etc.*

Functionality of the embodiment of print system 10 of FIG. 1 is depicted in the flowchart of FIG. 2. As shown in FIG. 2, print system or method 10 may be construed as beginning at block 210, where information corresponding to user authorization for access to a feature(s) is enabled to be received by a printing device. In some embodiments, the information corresponding to the user authorization is provided via

a Radio Frequency Identification (RFID) tag, embodiments of which will be described later. In block 220, a feature(s) of the printing device that corresponds to the received information is enabled. In particular, if is determined that the user is authorized access to the feature, the feature(s) can be enabled.

A representative printing device that can be used in print systems of the present invention will now be described with reference to the schematic diagram of FIG. 3. As shown in FIG. 3, printing device 110 includes a print cartridge 310 that contains a print substance, *e.g.*, ink, toner, *etc.*, for use by the printing device in performing a printing operation. Printing device 110 also includes an identification reader system 320 that is adapted to communicate with the print cartridge. In particular, although not required in all embodiments, the print cartridge can include identification information 330 that can be communicated to the identification reader system 320.

In those embodiments where the print cartridge includes identification information, the printing device preferably is configured so that the user can be notified that the installed print cartridge may not be authentic, *e.g.*, an original, non-refurbished print cartridge associated with the manufacturer of the printing device. This could be accomplished unless the print cartridge installed in the printing device is able to communicate identification information to the identification reader system. In such an embodiment, when the identification reader system detects the appropriate identification information from the print cartridge, *e.g.*, the information corresponds to information stored by the printing device, enhanced print functionality of the printing device also may be enabled.

As shown in FIG. 3, a feature-enabling system 100 also can be included in the printing device. In such an embodiment, feature-enabling system 100 preferably

communicates with identification reader system 320. In particular, the identification reader system can be used to determine whether a user has provided appropriate information, *e.g.*, feature authorization information 160 provided by an RFID tag, to the printing device so that printing can be enabled with the associated feature(s).

FIG. 4 is a schematic diagram depicting an embodiment of an identification tag/reader system 400 that can be used in print systems of the invention. As shown in FIG. 4, identification tag/reader system 400 includes an ID reader system 320 and a tag 410. Preferably, printing device 110 implements ID reader system 320, which includes a transmitter/receiver (Tx/Rx) 420 and a control/sequencer 430. Tx/Rx 420 modulates an RF carrier according to a selected protocol. The RF carrier is propagated by the Tx/Rx 420 and can be coupled to an antenna (not shown) of the tag 410. The tag rectifies the RF signal and uses the energy for powering various functions of the tag. For instance, the tag can store readable information in memory 440, *e.g.*, non-volatile memory, and/or can retrieve data, such as feature authorization information 160, for transmission back to the ID reader system.

In order to transmit data back to the ID reader system, the tag typically uses load modulation, where a resistive load is switched across a power bus (not shown) of the tag. This causes a change in the loading of the antenna (not shown) of the tag, with the change in the loading being detectable by the ID reader system. Switching of a resistive load can be accomplished by Tx/Rx control 450. Depending upon the frequency used, the transmission range of data from a tag to an ID reader system can vary. For example, transmission ranges can vary from fractions of inches to several feet. Clearly, one of ordinary skill in the art should be able to select a suitable frequency based on the particular application.

Other functionality also can be provided by embodiments of the identification tag/reader system 400. By way of example, the ID reader system can be configured to determine whether multiple tags are within the reception range of the reader and/or whether multiple tags are attempting to respond to the reader simultaneously. Additionally, data to be stored within a tag may be encrypted prior to transmission. Challenge/response techniques also may be used.

Reference will now be made to the schematic diagram of FIG. 5, which depicts a representative embodiment of a printing device 110 that can be used to implement a feature-enabling system 100. Note, feature-enabling system 100 can be implemented in software, firmware, hardware, or a combination thereof. When implemented in hardware, feature-enabling system 100 can be implemented with any or a combination of various technologies. By way of example, the following technologies, which are each well known in the art, can be used: a discrete logic circuit(s) having logic gates for implementing logic functions upon data signals, an application specific integrated circuit (ASIC) having appropriate combinational logic gates, a programmable gate array(s) (PGA), and a field programmable gate array (FPGA).

When implemented in software, feature-enabling system 100 can be a program that is executable by a computer or processor-based device. For the purpose of the following discussion, printing device 110 is considered an example of such a computer or processor-based device.

Generally, in terms of hardware architecture, printing device 110 of FIG. 5 includes a processor 502, memory 504, and one or more input and/or output (I/O) devices 506 (or peripherals) that are communicatively coupled via a local interface 508. Local interface 508 can be, for example, one or more buses or other wired or wireless connections, as is known in the art. Local interface 508 can include

additional elements, which are omitted for ease of description. These additional elements can be controllers, buffers (caches), drivers, repeaters, and/or receivers, for example. Further, the local interface may include address, control, and/or data connections to enable appropriate communications among the components of printing device 110.

Processor 502 can be a hardware device configured to execute software that can be stored in memory 504. Processor 502 can be any custom made or commercially available processor, a central processing unit (CPU) or an auxiliary processor among several processors. Additionally, the processor can be a semiconductor-based microprocessor (in the form of a microchip), for example.

Memory 504 can include any combination of volatile memory elements (*e.g.*, random access memory (RAM, such as DRAM, SRAM, *etc.*)) and/or nonvolatile memory elements (*e.g.*, ROM, hard drive, tape, CDROM, *etc.*). Moreover, memory 504 can incorporate electronic, magnetic, optical, and/or other types of storage media. Note that memory 504 can have a distributed architecture, where various components are situated remote from one another, but can be accessed by processor 502.

The software in memory 504 can include one or more separate programs, each of which comprises an ordered listing of executable instructions for implementing logical functions. The software in the memory 504 includes feature-enabling system 100 and a suitable operating system (O/S) 510. The operating system 510 controls the execution of other computer programs, such as feature-enabling system 100. Operating system 510 also can provide scheduling, input-output control, file and data management, memory management, and communication control and related services.

The I/O device(s) 506 can include input devices, such as a keypad, for example. I/O device(s) 506 also can include output devices, such as a display device

and printing mechanism(s), for example. I/O device(s) 506 may further include devices that are configured to communicate both inputs and outputs, such as a network communication port and ID reader system 507, for example.

When the printing device 110 is in operation, processor 502 is configured to execute software stored within the memory 504, communicate data to and from the memory 504, and generally control operations of the printing device 110. Feature-enabling system 100 and the O/S 510, in whole or in part, are read by the processor 502, perhaps buffered within processor 502, and then executed.

When feature-enabling system 100 is implemented in software, it should be noted that the feature-enabling system can be stored on any computer readable medium for use by or in connection with any computer-related system or method. In the context of this document, a computer-readable medium is an electronic, magnetic, optical, or other physical device or means that can contain or store a computer program for use by or in connection with a computer-related system or method. Feature-enabling system 100 can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions.

As used herein, a "computer-readable medium" can be any means that can store, communicate, propagate or transport a program for use by or in connection with an instruction execution system, apparatus, or device. Thus, a computer readable medium can be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of a computer-readable medium include the

following: an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (electronic), a read-only memory (ROM) (electronic), an erasable programmable read-only memory (EPROM, EEPROM, or Flash memory) (electronic), an optical fiber (optical), and a portable compact disc read-only memory (CDROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program could be electronically captured, via optical scanning of the paper or other medium, then compiled, interpreted or otherwise processed in a suitable manner, if necessary, and then stored in a computer memory.

Reference will now be made to the flowchart of FIG. 6, which depicts the functionality of a representative embodiment of feature-enabling system 100. In this regard, each block of the flowchart represents a module segment or portion of code that comprises one or more executable instructions, or logic for implementing the specified logical function(s). It should also be noted that in some alternative implementations the functions noted in various blocks of FIG. 6, or any other of the accompanying flowcharts, may occur out of the order in which they are depicted. For example, two blocks shown in succession in FIG. 6 may, in fact, be executed substantially concurrently. In other embodiments, the blocks may sometimes be executed in the reverse order depending upon the functionality involved.

As shown in the flowchart of FIG. 6, the feature-enabling system or method 100 may be construed as beginning at block 610, where information corresponding to user authorization is received. In particular, the information corresponds to whether the user is authorized to enable one or more features of the printing device. In block 620, a determination is made as to whether the user is authorized. If it is determined that the user is authorized, the process may proceed to block 630, where feature-

enabling information is retrieved. More specifically, information that can be used to enable the feature(s) desired by the user is located and accessed. In some embodiments, this can include accessing information available via a Web site and/or accessing information stored in memory associated with the printing device. In block 640, the feature(s) of the printing device is enabled using the feature-enabling information. If, however, it is determined that the user is not authorized, use of the feature, the process, may return to block 610.

By using a feature-enabling system like that described above, a user may be able to activate one or more features of a printing device as desired. In particular, enabling of a feature can be accomplished by providing the appropriate feature authorization information to a printing device so that the feature-enabling system of the printing device can activate the desired feature. Thus, when the feature authorization information is embodied in a tag, *e.g.*, tag 410 of FIG. 4, a user desiring a particular feature could purchase such a tag. Such tags could be offered or sold by the manufacturer of the printing device, for example.

In some embodiments, various features of a printing device can be included in the printing device when sold or otherwise provided to a user. However, not all of the included features may be enabled for use. In such an instance, the user may be required to purchase access to the currently disabled features separately before these features can be enabled. Although potentially more burdensome to the user, this technique can enable a manufacturer or assembler of printing devices to produce printing devices with like functionality, *e.g.*, the printing devices could incorporate the same firmware, thereby potentially reducing manufacturing costs. Based on the particular model or version of the printing device, however, various features of the printing devices could be selectively enabled by the user after purchase.

Reference will now be made to the schematic diagram of FIG. 7, which depicts another embodiment of a feature-enabling system 100 of the present invention. As shown in FIG. 7, the feature-enabling system or method 100 may be construed as beginning at block 710, where information corresponding to user authorization is received. In block 720, a determination is made as to whether the user is authorized access to one or more features. If it is determined that the user is authorized, the process may proceed to block 730, where feature-enabling information is retrieved. More specifically, information that can be used to enable the feature(s) desired by the user is located and accessed. In some embodiments, this can include accessing information available via a Web site and/or accessing information stored in memory of the printing device. Note, when the feature-enabling information is provided via a Web site or other location accessible via the Internet, the information corresponding to the user authorization can include a Uniform Resources Locator (URL) associated with the feature-enabling information. The feature-enabling system could then access the feature-enabling information by using the URL. If, however, it is determined that the user is not authorized use of the feature(s), the process may return to block 710. In block 740, the feature(s) of the printing device is enabled using the retrieved feature-enabling information.

Proceeding to block 750, information corresponding to identification information of a print cartridge, *e.g.*, information 330 of FIG. 3, of the printing device is received. In block 760, a determination is made as to whether the information associated with the print cartridge corresponds to the printing device. In some embodiments, this may include comparing identification information of the print cartridge to information stored by the printing device. If it is determined that the information correspond, the process may proceed to block 770, where printing, *e.g.*,

enhanced printing that may include one or more features supported by information provided via the print cartridge, is enabled. If, however, the information do not correspond, the process may return to block 750. Thus, when the information contained in the print cartridge does not correspond to the printing device, the user may be notified that the print cartridge may not be an authentic and/or non-refilled cartridge, for example. Thereafter, printing, can be enabled. Note, if the information do not correspond, enhanced printing functionality may not be enabled.

Reference will now be made to the schematic diagram of FIG. 8, which depicts another embodiment of a print system 10 of the present invention. As shown in FIG. 8, print system 10 includes a feature-enabling system 100, which is associated with a printing device 110, as well as feature-enabling information 120. Typically, the feature-enabling information is associated with a device that is capable of providing information to the printing device. By way of example, the feature-enabling information can be associated with a Web server, *e.g.*, server 830, among others.

In FIG. 8, feature-enabling system 100 communicates with the feature-enabling information via a communication link 840. Various other devices also can communicate via the link, such as a workstation 850. Also depicted in FIG. 8 is an user authorization tag 860 that can indicate that the user is authorized access to one or more features as well as enable the printing device to retrieve and/or access information for enabling one or more features of the printing device.

Functionality of the embodiment of the feature-enabling system 100 of FIG. 8 will now be described with reference to the flowchart of FIG. 9. As shown in FIG. 9, the feature-enabling system or method 100 may be construed as beginning at block 910, where information corresponding to user authorization pertaining to a feature is received via a user authorization tag. By way of example, such a tag could be

purchased by a user and then placed in proximity to a printing device that is to be enabled with the feature corresponding to the tag. In this manner, a user can potentially enable features in an ala cart fashion, whereby, when the user intends to enable a particular feature, the user can acquire a tag associated with that feature.

In some embodiments, an ID reader system associated with the printing system can be designed so that the tag can be placed near an outer surface of the printing device for reading. In other embodiments, the printing device can incorporate a slot, for example, into which the tag can be placed so as to provide the tag in close enough proximity to the reader system so that information can be received from the tag.

Proceeding to block 920, a determination may be made as to whether the information received via the tag corresponds to information associated with the printing device. In particular, a determination is made as to whether the tag is valid for use in enabling one or more features of the printing device. If is determined that the information contained in the tag corresponds, the process may proceed to block 930. In block 930, the printing device, or another device associated with the printing device, can retrieve information that is adapted to enable the desired feature(s). Thereafter, such as depicted in block 940, the feature(s) can be enabled.

Proceeding to block 950, information to be printed can be received by the printing device. Thereafter, such as depicted in block 960, the information is enabled to be printed by the printing device using the enabled feature. Note, in some embodiments, if it is determined that the tag is no longer communicating with the printing device, printing with the feature(s) associated with the tag(s) can be disabled.

Functionality of another embodiment of the feature-enabling system 100 will now be described with reference to the flowchart of FIG. 10. As shown in FIG. 10, the feature-enabling system or method 100 may be construed as beginning at block

1010, where information corresponding to user authorization is received via an identification tag. In block 1020, a determination is made as to whether the information received via the tag corresponds to information associated with the printing device. If is determined that the information contained in the tag corresponds, the process may proceed to block 1030, where the printing device, or another device associated with the printing device, can retrieve information that is adapted to enable the feature(s). Thereafter, such as depicted in block 1040, the feature can be enabled.

Proceeding to block 1050, information to be printed can be received by the printing device. In block 1060, information corresponding to a print cartridge associated with the printing device is received. In block 1070, a determination is made as to whether the information corresponding to the print cartridge corresponds to the printing device. If it is determined that the information correspond, the process may proceed to block 1080, where printing, *e.g.*, enhanced printing that may include one or more features supported by information provided via the print cartridge, is enabled. If, however, the information do not correspond, the process may return to block 1060. Thus, when the information contained in the print cartridge does not correspond to the printing device, the user may be notified that the print cartridge may not be an authentic and/or non-refilled cartridge, for example. Thereafter, printing, can be enabled. Note, if the information do not correspond, enhanced printing functionality may not be enabled.

The foregoing description has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Modifications and/or variations are possible in light of the above teachings. The embodiments discussed, however, were chosen and described to

illustrate the principles of the invention and its practical application to thereby enable one of ordinary skill in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. All such modifications and variations are within the scope of the invention as determined by the appended claims.